

Map Unit Properties Table

Age	Unit Name (map symbol)	Description	Significant Features	Depositional Setting	Resource Potential	Hazard Potential	Resistance to Erosion
Quaternary	Alluvium and terrace gravel (QaI)	Gray, light- red, and light- brown, poorly sorted mixture of clay, silt, sand, and gravel; partly consolidated; inter- tongue with or is overlapped by intermediate or old alluvial terrace deposits; thickness is 10 to 40 feet (3 to 12 m)	Supports moderate to thick growth of sagebrush, grass, cactus, and tall shrubs	Along streams and rivers; includes talus, alluvial fans, and sand deposits	Sand and gravel suitable for construction of highways; rounded cobbles used for decorative stone; gravels contain gold	Faults bound but do not offset alluvium	Low: commonly subject to arroyo erosion and sheet- wash flooding and ponding
	Dune sand (Qd)	White, reddish- brown, and pink unconsolidated windblown, fine- to coarse- grained sand	Active dunes in large open valley areas; a few minor barchan dunes, but no parabolic dunes; stabilized by grassy and shrubby vegetation or by biological soil crusts	Forms climbing dunes [12 to 30 feet (3.7 to 9 m)] that ramp upward toward steep, downslope topography	Biologic soil crusts form on surface of unit	None Documented	Low
	Landslide deposits (Qs)	Includes large rotational slides composed of jostled strata and disaggregated rock falls	Associated with the Triassic- age Chinle Formation	None Documented	Not a serious hazard unless series of wet years occurs	Low	Low
	Entrada Sandstone (Je)	Consists of lower Slickrock Member and the Moab Tongue; light- colored (often pale- orange) sandstone with minor cross- bedding occurring above a prominent horizontal bedding plane; fine- grained, massive, and friable; thickness: 225 - 350 feet (69 and 107 m)	Forms near vertical cliffs and hummocky knobs; Slickrock Member forms arches in nearby Arches National Park	Coastal—tidal flats, beaches, low islands, and dunes	None Documented	None Documented	High
	Navajo Sandstone (TRn)	Buff to pale- orange, well- sorted, fine- to medium- grained, massive, sandy limestone and stringers of red chert; inter- tongues with underlying Kayenta Formation; thickness 250 - 450 feet (76 - 137 m)	Spectacular, large- scale cross- beds	Eolian sand accumulations	None Documented	Rockfall debris	Overslies cliffs of Kayenta Fm.; generally forms rounded nearly white cliffs and erosional mounds
	Kayenta Formation (TRk)	Reddish- brown, massive, cross- bedded, fine- grained, well- sorted sandstone; thickness 30 - 435 feet (9 - 133 m)	Fluvial—outcrops almost universally display classic cut- and- fill deposits typical of river deposition	Freshwater fossils and dinosaur tracks on bedding surfaces	None	Rockfalls occur sporadically along the cliff walls	High: Divided into lower cliff- forming and upper slope- forming units; forms low cliffs and ledges above the massive Wingate cliffs
	Wingate Sandstone (TRw)*	Reddish- brown, massive, cross- bedded, fine- grained, well- sorted sandstone; thickness 30 - 435 feet (9 and 133 m)	Forms prominent, near- vertical cliffs	Generally eolian with some fluvial bedding	None	None	High
	Chinle Formation (TRc)	Bentonitic clayey sandstones and siltstones; members in ascending order: Monitor Butte, Moss Back (stream sand and gravel), Petrified Forest (mudstone), Owl Rock (including the “black ledge member”), and Church Rock (upper siltstone); locally contains scattered ledges of conglomeratic sandstones; thickness between 330 and 660 feet (101 and 201 m)	Pastel colors: variegated red, purple, green, yellow slopes; fine- grained siltstone and sandstone cliffs of the “black ledge member,” heavily stained with desert varnish	Streams and deltas	Petrified wood; basal conglomerate layer rich in radioactive wood fragments; Moss Back Member contains significant amounts of bentonite (expanding and shrinking clay)—uranium	Rockfall debris; landslides potential; Petrified Forest Member contains bentonite (expanding and shrinking clay)—very poor for construction of houses or roadways	Upper slopes form broad slopes beneath Wingate Sandstone cliffs, often heavily masked by debris fallen from the cliffs; roads and trails are built on resistant benches eroded from this formation
	Moenkopi Formation (TRm)	Reddish- brown, evenly- bedded, ripple- marked, cross- laminated siltstones and fine- grained sandstones; members include in ascending order: Hoskinnini, Lower slope- forming, Sinbad Limestone, Ledge- forming, and Upper slope- forming; averages 600 feet (183 m) thick.	Tidal mud flat deposition (i.e., streams and deltas); grades westward into marine deposits along the W border of Colorado Plateau	Tidal mud flat deposition (i.e., streams and deltas); grades westward into marine deposits along the W border of Colorado Plateau	Small- scale ripples, desiccation cracks, raindrop impressions, and burrows; widely used for decorative stone	Rockfall debris	Forms broad terraces and slopes above the more resistant Permian rocks throughout the park
	White Rim Sandstone (Pw)	Light- gray to yellowish- gray (dark- gray in the vicinity of the park), fine- grained, cross- bedded sandstone; thickness 0-250 feet (76 m)	Considered by many to be entirely eolian, but may represent the landward migration of a marine facies	None Documented	Rockfall debris	Rockfall debris	Forms slopes and ledges; separates cliff- forming units above and below
Triassic	Glen Canyon Group	Cultler Group				Permian	
	Organ Rock Shale (Po)	Dark- red, fine- to coarse- grained, arkosic, thin- bedded, sandstone and siltstone; includes dark- red conglomeratic sandstone lenses that form ledges in upper part. Huntton and others (1982): reddish- brown siltstones and sandy shales 250 to 400 feet (76 to 122 m) thick. Billings and others (2002): incomplete section about 60 feet (18 m) thick in NE quarter of map; forms red caprock, less than 30 feet (9 m) thick, on small, unnamed mesas in southern part of map area.	Oxidized mud; gradational SW facies change from coarse- grained arkosic sequence to alternating fine- grained sandstone, siltstone, and mudstone sequence	None Documented	Rockfall debris	Rockfall debris	Forms slopes and ledges; separates cliff- forming units above and below

Age	Unit Name (map symbol)	Description	Significant Features	Depositional Setting	Resource Potential	Hazard Potential	Resistance to Erosion
	Undivided Cutler Group–Organ Rock Shale transition (Pu0)	Inter-tongues with underlying Cedar Mesa Sandstone forming a gradational and arbitrary vertical and lateral contact marked by a color contrast from dark- red Organ Rock Shale to white (or light- red) Cedar Mesa Sandstone		Displays lateral inter- tonguing and facies change between Organ Rock Shale and undivided Cutler Group	None Documented	Rockfall debris	
	Cedar Mesa Sandstone (Pc)	Light- red to white, slope- and cliff- forming, medium- to thick- bedded sandstone and siltstone interbedded with dark- red, coarse- grained, arkosic gravel, sandstone, siltstone, and mudstone; thickness as much as 1,500 feet (457 m) (Billingsley and others, 2002). Huntoon and others (1982): white to pale- reddish- brown, salmon, massive, cross- bedded sandstones interbedded with lenses of red, gray, green, and brown sandstones; includes thin- bedded, blue- gray limestone beds as channel lenses interbedded within dark- red siltstone and arkosic gravel in lower slope- red, thin- bedded siltstone, sandstone, and interbedded blue- gray, thin- bedded limestone and calcareous sandstone; 200 to 1,200 feet (61 and 366 m)	Interpretation controversial (eolian or shallow marine), probably a coastal accumulation at or near a fluctuating shoreline	Foraminifera, rare crinoid ossicles, and occasional glauconite grains	Rockfall debris		
	Undivided Cutler–Cedar Mesa Sandstone transition (Puc)	Light- red, fine- to coarse- grained, well- sorted, cliff- forming sandstone and interbedded dark- red, coarse- grained, slope- forming gravel, sandstone, and mudstone beds; includes minor beds of white, fine- to coarse- grained sandstone and blue- gray, thin- bedded, fossiliferous limestone; thickness averages 800 feet (244 m)	Dramatic and colorful rock sculptures	Shallow marine and eolian; two types of sedimentation shifted back and forth; displays lateral inter- tonguing and facies change between Cedar Mesa Sandstone and undivided Cutler Group	Fossiliferous limestone	Rockfall debris	Forms a series of alternating sandstone cliffs and siltstone slopes
	Cutler Group undivided (Pu)	Red, arkosic sandstones and white marine sandstones, with interbedded red shales; thickness is between 1,800 and 2,200 feet (549 and 671 m)	Fluvial, alluvial- fan origin	Coastal lowlands; limestone beds thicken and thin locally and pinch out laterally; grades southward into red beds of the Halgaito Formation just S of the map area, and NE into the arkosic rocks of the Cutler Formation just N of the map area	None Documented	Rockfall debris	Forms series of alternating slopes and ledges
	Elephant Canyon Formation (Pe)	Blue- gray, thin- to medium- bedded, cliff- and slope- forming fossiliferous limestone, calcareous sandstone, and interbedded red and gray- red calcareous siltstone and mudstone. According to Huntoon and others (1982), unit is gray, cherity, chalky limestone and dolomite interbedded with pale- red sandstones, blue- gray siltstones, and thin beds of anhydrite with thickness of between 400 and 1,500 feet (122 and 457 m).	“Type locality” near confluence of Green and Colorado Rivers	Advancing seas	None Documented	Rockfall debris	Forms a series of limestone cliffs and sandstone and siltstone slopes
	Halgaito Shale–Elephant Canyon Formation transition (Phe)**	Displays lateral inter- tonguing and facies change between Halgaito Shale and Elephant Canyon Formation		Deposited in shallow seas and coastal plains (limestone beds); fluvial deposition and some eolian deposition	Generally fossiliferous lower member with brachiopods, bryozoa, crinoid debris, and rare cephalopods and trilobites	Associated with debris flows; produces rockfall debris	Forms ledges and slopes
	Halgaito Shale (Ph)**	Reddish- brown and purple arkosic sandstones, red siltstones, claystones, and conglomerates with thin marine limestone beds; thickness between 400 and 700 feet (122 and 213 m)		Contains numerous fossil brachiopods, crinoids, bryozoa, corals, pelecypods, and gastropods; flat slabs of fossiliferous limestone collected for decorative stone	None Documented	None Documented	High: Forms ledges and slopes and rugged, often impassable, steep canyon walls (>1,000 feet [305 m] high)
	Hermosa Group	Blue- gray, thick- bedded, cliff- forming limestone, thin- bedded calcareous sandstone, and interbedded, thin- bedded siltstone (Billingsley et al., 2002). Huntoon and others (1982): dark- gray, thick- bedded limestone interbedded with gray cherity limestones; blue, red, and gray shales and sandstones. Thickness 1,050 to 1,500 feet (320 and 457 m); incomplete section (600 to 800 feet [183 to 244 m]) exposed in the map area (Billingsley and others, 2002).	Forms a sequence of cyclic alternating limestone, sandstone, and siltstone beds that comprise the bulk of the canyon walls along the Colorado River	Salt beds deposited in relatively deep, highly saline seawaters in a closed basin; includes 29 cycles of halite (common salt) precipitation and associated clastic deposition; salt flowage bulged overlying strata to form anticlinal structures and domes	Mined commercially for potash (fertilizer); most common salt minerals: halite, carnallite (source of magnesium), and sylvite (KCl); oil shows in intervals of dolomite, shale, and anhydrite	Slope forming when exposed	
	Paradox Formation (IPp)	Salt, anhydrite, and gypsum interbedded with euxinic (deposited under restricted circulation) black shales and limestones			None Documented		

* Although the Wingate Sandstone was originally believed to be of Late Triassic age, palynological studies and regional stratigraphic relationships reveal that it is of Early Jurassic age (Peterson and Pipiringos, 1979).

** Two of the units included in the Cutler Group (Elephant Canyon Formation and Halgaito Shale) are now considered to be Pennsylvanian, not Permian, in age. Baars (1962) originally identified the units as Permian, but based on reexamination of fusulinids, has established a Pennsylvanian age (Baars, 2000).